

CLAIMS

WHAT IS CLAIMED:

1. A method for controlling a manufacturing process, comprising:

processing a plurality of workpieces in a tool;

5 monitoring a rework rate associated with the workpieces processed in the tool; and

initiating an automatic corrective action in response to the rework rate being greater than a predetermined threshold.

2. The method of claim 1, wherein initiating the automatic corrective action further comprises sending an alert message to an operator of the tool.

3. The method of claim 1, wherein initiating the automatic corrective action further comprises logging the tool out of service.

4. The method of claim 3, wherein logging the tool out of service includes sending a message to a process control server.

5. The method of claim 1, further comprising controlling at least one operating recipe parameter of the tool based on a process control model having at least one control state variable, and wherein initiating the automatic corrective action further comprises determining
20 a value of the control state variable.

6. The method of claim 5, further comprising:
processing a workpiece requiring rework in the tool; and

controlling the processing of the workpiece requiring rework based on the determined value of the control state variable.

7. The method of claim 5, further comprising:

retrieving metrology data associated with the processing of the workpieces in the tool;
and

determining the value of the control state variable based on the metrology data.

8. The method of claim 7, wherein the workpieces are arranged in lots, and retrieving the metrology data comprises retrieving the metrology data for workpieces in a particular lot associated with a workpiece requiring rework.

9. The method of claim 8, further comprising:

processing the workpiece requiring rework in the tool; and

controlling the processing of the workpiece requiring rework based on the determined value of the control state variable.

10. The method of claim 5, wherein the process control model includes a control equation including the control state variable, and the method further comprises:

retrieving metrology data associated with the processing of the workpieces in the tool;
and

solving the control equation in reverse based on the metrology data to determine the value of the control state variable.

11. The method of claim 1, wherein processing the plurality of workpieces in the tool comprises processing the plurality of workpieces in a photolithography tool.

12. The method of claim 1, wherein processing the plurality of workpieces in the
5 tool comprises processing the plurality of workpieces in a polishing tool.

13. A method for controlling a manufacturing process, comprising:
processing a plurality of workpieces in a tool;
controlling at least one operating recipe parameter of the tool based on a process
10 control model having at least one control state variable;
monitoring a rework rate associated with the workpieces processed in the tool; and
determining a value of the control state variable in response to the rework rate being
greater than a predetermined threshold.

14. The method of claim 13, further comprising:
retrieving metrology data associated with the processing of the workpieces in the tool;
15 and
determining the value of the control state variable based on the metrology data.

20 15. The method of claim 13, further comprising:
processing a workpiece requiring rework in the tool; and
controlling the processing of the workpiece requiring rework based on the determined
value of the control state variable.

16. The method of claim 14, wherein the workpieces are arranged in lots, and retrieving the metrology data comprises retrieving the metrology data for workpieces in a particular lot associated with a workpiece requiring rework.

5 17. The method of claim 16, further comprising:
processing the workpiece requiring rework in the tool; and
controlling the processing of the workpiece requiring rework based on the determined value of the control state variable.

10 18. The method of claim 13, wherein the process control model includes a control equation including the control state variable, and the method further comprises:
retrieving metrology data associated with the processing of the workpieces in the tool;
and
15 solving the control equation in reverse based on the metrology data to determine the value of the control state variable.

19. The method of claim 13, wherein processing the plurality of workpieces in the tool comprises processing the plurality of workpieces in a photolithography tool.

20 20. The method of claim 13, wherein processing the plurality of workpieces in the tool comprises processing the plurality of workpieces in a polishing tool.

21. A method for controlling a manufacturing process, comprising:
processing a plurality of workpieces in a tool;

controlling at least one operating recipe parameter of the tool based on a process
control model having at least one control state variable;
monitoring a rework rate associated with the workpieces processed in the tool;
identifying a condition where the rework rate is greater than a predetermined
5 threshold;
retrieving metrology data associated with the processing of the workpieces in the tool;
solving the control equation in reverse based on the metrology data to determine a
new value for the control state variable; and
processing a subsequent workpiece in the tool in accordance with the new value of the
10 control state variable.

22. The method of claim 21, wherein the workpieces are arranged in lots, and
retrieving the metrology data comprises retrieving the metrology data for workpieces in a
particular lot associated with the subsequent workpiece.

23. The method of claim 21, wherein processing the plurality of workpieces in the
tool comprises processing the plurality of workpieces in a photolithography tool.

24. The method of claim 21, wherein processing the plurality of workpieces in the
20 tool comprises processing the plurality of workpieces in a polishing tool.

25. A manufacturing system, comprising:
a tool adapted to process a plurality of workpieces; and

a rework controller adapted to monitor a rework rate associated with the workpieces processed in the tool and initiate an automatic corrective action in response to the rework rate being greater than a predetermined threshold.

5 26. The system of claim 25, wherein the rework controller is further adapted to send an alert message to an operator of the tool in response to the rework rate being greater than a predetermined threshold.

10 27. The system of claim 25, wherein the rework controller is further adapted to log the tool out of service in response to the rework rate being greater than a predetermined threshold.

15 28. The system of claim 27, wherein the rework controller is further adapted to log the tool out of service by sending a message to a process control server in response to the rework rate being greater than a predetermined threshold.

20 29. The system of claim 25, further comprising a process controller adapted to control at least one operating recipe parameter of the tool based on a process control model having at least one control state variable, and the rework controller is further adapted to determine a value of the control state variable in response to the rework rate being greater than a predetermined threshold.

30 30. The system of claim 29, wherein the tool is further adapted to process a workpiece requiring rework, and the process controller is further adapted to control the

processing of the workpiece requiring rework based on the determined value of the control state variable.

31. The system of claim 29, wherein the rework controller is further adapted to
5 retrieve metrology data associated with the processing of the workpieces in the tool and determine the value of the control state variable based on the metrology data.

32. The system of claim 31, wherein the workpieces are arranged in lots, and the
metrology data comprises metrology data for workpieces in a particular lot associated with a
10 workpiece requiring rework.

33. The system of claim 32, wherein the tool is further adapted to process the
workpiece requiring rework, and the process controller is further adapted to control the
processing of the workpiece requiring rework based on the determined value of the control
15 state variable.

34. The system of claim 29, wherein the process control model includes a control
equation including the control state variable, and the rework controller is further adapted to
retrieve metrology data associated with the processing of the workpieces in the tool and solve
20 the control equation in reverse based on the metrology date to determine the value of the control state variable.

35. The system of claim 25, wherein the tool comprises a photolithography tool.

25 36. The system of claim 25, wherein the tool comprises a polishing tool.

37. A manufacturing system, comprising:
a tool adapted to process a plurality of workpieces;
a process controller adapted to control at least one operating recipe parameter of the
5 tool based on a process control model having at least one control state
variable; and
a rework controller adapted to monitor a rework rate associated with the workpieces
processed in the tool and determine a value of the control state variable in
response to the rework rate being greater than a predetermined threshold.

38. The system of claim 37, wherein the rework controller is further adapted to
retrieve metrology data associated with the processing of the workpieces in the tool and
determine the value of the control state variable based on the metrology data.

39. The system of claim 37, wherein the tool is further adapted to process a
workpiece requiring rework, and the process controller is further adapted to control the
processing of the workpiece requiring rework based on the determined value of the control
state variable.

20 40. The system of claim 39, wherein the workpieces are arranged in lots, and the
metrology data comprises metrology data for workpieces in a particular lot associated with a
workpiece requiring rework.

25 41. The system of claim 40, wherein the tool is further adapted to process the
workpiece requiring rework, and the process controller is further adapted to control the

processing of the workpiece requiring rework based on the determined value of the control state variable.

42. The system of claim 37, wherein the process control model includes a control equation including the control state variable, and the rework controller is further adapted to retrieve metrology data associated with the processing of the workpieces in the tool and solve the control equation in reverse based on the metrology data to determine the value of the control state variable.

43. The system of claim 37, wherein the tool comprises a photolithography tool.

44. The system of claim 37, wherein the tool comprises a polishing tool.

45. A system for controlling a manufacturing process, comprising:

a tool adapted to process a plurality of workpieces;

a process controller adapted to control at least one operating recipe parameter of the tool based on a process control model having at least one control state variable; and

a rework controller adapted to monitor a rework rate associated with the workpieces processed in the tool, identify a condition where the rework rate is greater than a predetermined threshold, retrieve metrology data associated with the processing of the workpieces in the tool, and solve the control equation in reverse based on the metrology data to determine a new value for the control state variable, wherein the tool is further adapted to process a subsequent workpiece in accordance with the new value of the control state variable.

46. The system of claim 45, wherein the workpieces are arranged in lots, and the metrology data comprises metrology data for workpieces in a particular lot associated with the subsequent workpiece.

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47. The system of claim 45, wherein the tool comprises a photolithography tool.

48. The system of claim 45, wherein the tool comprises a polishing tool.

49. A manufacturing system, comprising:

means for processing a plurality of workpieces;

means for monitoring a rework rate associated with the means for processing of workpieces; and

means for initiating an automatic corrective action in response to the rework rate being greater than a predetermined threshold.

50. A manufacturing system, comprising:

means for processing a plurality of workpieces;

means for controlling at least one operating recipe parameter of the processing based on a process control model having at least one control state variable;

means for monitoring a rework rate associated with the means for processing of workpieces; and

means for determining a value of the control state variable in response to the rework rate being greater than a predetermined threshold.

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51. A manufacturing system, comprising:
means for processing a plurality of workpieces;
means for controlling at least one operating recipe parameter of the processing based
on a process control model having at least one control state variable;
5 means for monitoring a rework rate associated with the means for processing of
workpieces;
means for identifying a condition where the rework rate is greater than a
predetermined threshold;
means for retrieving metrology data associated with the processing of the workpieces;
means for solving the control equation in reverse based on the metrology data to
determine a new value for the control state variable; and
means for processing a subsequent workpiece in accordance with the new value of the
control state variable.